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ON KEEPING A METEOROLOGICAL JOURNAL.

FEW people pass from one year to another without any thought as to the past or the future. For ourselves we are writing page 1 of a new volume, and we think that a little time may be well spent in considering the objects and the duties connected with keeping a Meteorological Journal.

We do not profess prophetic powers, and therefore as regards the objects of such work, we can only mention those of which we are at present aware. But it must be remembered that just as past records, ignored in byegone times, are often of use and interest to subsequent generations; so is it with scientific facts; the generation which observes them, rarely extracts all the information which they are capable of yielding, but it is the duty of each generation to do its best towards providing for those who are to follow. There is, however, one moral duty connected with this subject to which we must call attention at once—namely, that no records are worthy of any generation, of any person, place, or organization which are not as accurate as it is reasonably practicable to make them.

Meteorological Journals are rarely kept for bad purposes; in fact, the only case of the kind that we recollect was a record at a watering place, which was so kept as to be more or less of a bait to catch visitors. Meteorological Journals are sometimes kept mainly from a vague curiosity as to weather changes, and partly also from old established habit. Records of this class generally embrace the reading of a thermometer outside a bedroom window, with perhaps the entry of a barometer to the nearest tenth of an inch; the time of reading depending upon the observer's personal convenience, and the record being interrupted whenever he goes from home. Fortunately, such records are generally entered in pocket memorandum books, and are, therefore, usually destroyed after the death of the observer.

We will suppose, however, that the observer is in earnest, and though his means may be limited, he is yet desirous that what he does shall be useful both to the men of his own time, and to those who come after. Now let us consider some of the uses which his records

will serve, and for the present we will confine our attention to the British Isles.

(1.) CLIMATE.—There are at present scarcely any absolutely accurate data whence we can learn the relative climate of our various health resorts. We are frequently consulted as to the destination of consumptive patients, but where are the data to prove the relative advantages even of the places which are in popular repute? Where can we find identical data, similarly observed, at Penzance, Torquay, Sidmouth, Ventnor, and Bournemouth? Accurate records are being made at some of these places, but there are twenty health resorts without accurate records for one that possesses any. One object, then, of a journal is to enable us to decide on the effect of different localities upon the human frame.

(2.) AGRICULTURE.—Accurate knowledge of the average climate of different localities, coupled with acquaintance with their geology, would render great services to agriculture. It is impossible to doubt that if farming were made more conformable to atmospheric conditions, it would be far more profitable than it is at present. It would do this in many ways. We will mention only two. (*a*) As regards manuring and cropping, the date of the former could profitably be so adjusted in connection with the normal date of heavy rains as to avoid the per centage washed into the drains, reaching its present extravagant figure, and (*b*) by teaching the farmer at precisely what distances he should lay his drain tiles.

(3.) ENGINEERING.—There are few branches of this science which are independent of Meteorologists. Is a town to be provided with a supply of water? The rainfall, over the watershed proposed to be taken up, must be ascertained. Is the town to be drained? The capacity of the sewers is regulated by the rainfall. Is a large light edifice to be erected? The force of the wind must not be ignored. As regards roofs, the probable quantity of snow must be considered. For example, as regards both wind and snow, how would the Bedford Station of the Midland Company fare if re-erected at Dalnaspidal, on the Highland line? Again, take the case of town sewerage, the rainfall and humidity of the district affect every stage of the works; the greater the rainfall the larger the sewers must be, and the less will be the value of the sewage for agriculture, while irrigation, as a mode of disposal in a district of heavy rainfall, would be ridiculous.

(4.) LEGAL.—It is impossible to quote the varied forms in which Meteorological Journals are useful in disputed questions. We will quote two, one small case and one large one. A tradesman was driving to market, his horse worth £70 fell down and broke its leg, and had to be killed. The owner claimed compensation from a tramway company, asserting that an imperfection of their roadway threw the horse down. All his witnesses swore that it was a fine morning, that there was not a trace of frost, and that the only possible cause of the accident was a defect in the iron of the tramway. The evidence on the other side was to the effect that it was a slippery frosty morning, and that the

horse fell down on sloping ground some yards from the tramway metal. The relative credibility of the two sets of witnesses was proved by the production of a Meteorological Journal, showing that there had been a slight frost in the air throughout the night, and a sharp one upon the grass. The other case was one involving several hundred thousand pounds. A company undertook to use their best endeavours to lay a telegraph cable by a certain date; they did not deliver it up until long after the time originally specified, and then the company for whom they laid it refused to accept it, or pay for it. In order to show that the company laying the cable "had used their best efforts," they produced evidence of a series of storms, during the three years that they had been at work, far exceeding the average, and probably without precedent.

(5.) SYNCHRONOUS METEOROLOGY AND STORM WARNINGS.—This branch of the science will probably always, and in all countries, be conducted by Government officials and at the national cost, and rightly so. But the judicious course appears to us to be, for the Governments to maintain only as many stations as are sufficient for ordinary circumstances, and when exceptional phenomena occur to apply to private observers for short extracts from their records.

We must not dwell further upon the uses of Meteorological Journals, but before proceeding to consider the duties of observers, we desire to say a few words respecting an abuse of Meteorological Journals, although we believe and rejoice in the belief, that it is rapidly decreasing.

There was a time (we put it in the past tense to avoid all offence) when it was not thought wrong to allow observers to take the trouble of copying out four or five hundred figures every month, and yet for the recipient to utilise but an infinitesimal portion thereof. We do not think that it was fair to observers to allow them to waste time in needless copying or needless observation.

THE DUTIES OF OBSERVERS.

We do not think that the majority of persons keeping Meteorological Journals regard themselves as thereby undertaking a certain responsibility, and certain duties. We think that they are. Irrespective of such proverbs as "What is done should be well done, what is not well done had better be let alone," and "What is worth doing at all is worth doing well," we hold that any one who undertakes to keep a record is bound to keep it carefully. We consider, in short, that there are reciprocal duties appertaining respectively to the observers and to those who reduce and publish their results. We have mentioned one duty on the part of recipients, and we now come to those of the observers.

The first essential is accuracy both of observation and of record. Accuracy involves a good deal more than would at first be thought likely. An accurate record of a bad instrument, or of a good instrument badly placed, is not merely useless, it is worse than useless—it is misleading; and to forward such a record is to lead the recipient into trouble. Accuracy, therefore, involves the keeping of a faithful

record of accurate instruments, properly placed. We string together some offences which have been committed by those generally regarded as high-class observers, and we leave them without comment.

One observer always read the wrong end of the vernier of his barometer; another, having a Fortin standard, never adjusted the mercury to the ivory point. One had a beautifully sensitive bifurcated grass minimum thermometer; it was broken, and he substituted (without making any entry of the fact) a 3s. 6d. thermometer with a bulb as thick as the top of one's finger. Such a change would utterly stultify any comparison of the radiation at that station. Another observer allowed $7\frac{1}{2}$ degrees of spirit to collect at the top of his minimum thermometer, and thus all his minimum temperatures were $7\frac{1}{2}$ degrees too low. A rain gauge was kept in use, and its record forwarded for publication after its receiving area had been entirely changed by its being run into by a mowing machine. Another was placed so close to a house that if a mass of snow slipped off the roof it would have fallen upon the gauge.

Probably we shall be told that it is injudicious to mention such things in print; that by mentioning them we discredit the general body of observers, both public and private; that the instances are mostly so gross that they must have been detected from the published results. We hold that the very fact that they were *not* detected justifies us in quoting them as warnings for observers of all classes. As to our throwing discredit upon English observers, any one is welcome to accuse us of that, for we do not think that a single observer would credit the accusation. We know something of observers, English, Scotch, Irish, Colonial and Foreign, and we say no more than this—that if, for our catalogue of offences, we had travelled beyond our own country, it would have contained even more remarkable features than it does.

Accuracy of record involves several points. The essentials are: neatness of writing, unmistakableness of figures, and accuracy in the arithmetical operations required. By neatness of writing we do not mean merely the proper formation of letters, though general improvement in that respect would be a benefit to others besides meteorologists, but keeping the observation book tidy, writing upon the lines, keeping the decimal points in a vertical line, not omitting terminal cyphers. This is a great mistake, and very frequent. It is quite true that

29·825	has the same meaning as		29·825
29·8	,,	,,	29·800
29·316	,,	,,	29·316
29·44	,,	,,	29·440

but the gain of time in omitting the cyphers is far outweighed by the loss of time and risk of inaccuracy in the subsequent addition. This habit is even more injurious as regards rainfall entries, for observers will sometimes in the same column enter half-an-inch as ·5 and ·50, even occasionally aggravating matters by omitting the decimal point. The rainfall entry should always consist of two figures beyond the decimal point, even if the amount is less than a tenth of an inch.

We have known some very comical false entries made—September with 31 days' observations is not very usual. Maximum temperatures entered in degrees in the rainfall column and cast up as rain, have occurred more than once; but the richest thing we ever heard of was an entry of 112; the observer never put any decimal points, and the entry therefore meant 1·12 in. on a certain date. Adjacent stations reporting no such fall on that day, enquiry was made of the observer, and he wrote to say that he was very sorry for having given trouble, but the figures which he had entered and added up as rainfall were the number of persons present at a parish meeting!

As to accuracy in the arithmetical operations we hardly know what to say. We believe that every one is liable to an occasional error; but there would be fewer if all obeyed the latter part of rainfall rule, No. X., viz., "All columns should be cast *twice*, once up and once down, so as to avoid the same error being made twice." Our objection to bad computing is twofold—first, because it implies lack of care; second, because it involves much extra labour. We know that some persons assume that if a column of figures has at the foot figures which are not the true sum of those figures the total should be corrected without further enquiry; but we hold such a course to be entirely wrong, because there is no proof whether the error is in the total or in one of the entries, and the chances are nearly equal. Yet when we, some years back, declined to accept the records of an observer who rarely cast one column correctly out of three, his chief told us that he found that many who were very weak in arithmetic were very good observers, and he kept him upon his staff.

"What a mistake for the Editor of a magazine mainly supported by meteorological observers to admit so long and strong an attack upon them." Oh, yes. We know many people would say so. But we rarely study expediency; we know that a staff of 90 good observers is better than one of 100 composed of 90 good and 10 bad, but that one of 100 good ones would be better still.

We believe that the time is coming, if indeed it has not come, when quality of work will be regarded as of more consequence than quantity. We know that the observers of this country, as a whole, are unsurpassed, and that the more their work is examined the more it will be appreciated. But we also know that there are some among them who should, and perhaps will, believe in the old copy-book motto—"Those are our best friends who tell us of our faults, and teach us how to avoid them."

GREAT STORMS.

We think that many of our readers may be glad to know that the February number of *The Cornhill Magazine* contains an anonymous, but very readable, paper upon the above subject. The article is a very long one, occupying more than twelve pages of that periodical; but it is very good, and the concluding portion so worthy of consideration

that we reprint it. Our readers may recognise in the first ten lines of our extract, the views which have been repeatedly urged in our own pages, and it is perhaps an augury of their acceptance that they are reproduced in a periodical of wide general circulation. Is it possible that we shall live to see the day when it ceases to be true (for true it still is, in spite of all that we have urged) that "the observing is out of all proportion to the thinking power in meteorology."

"If there are in reality any regularly recurring periods in weather phenomena, we can only hope to recognise them by the careful examination of meteorological records. It appears to us that those already made have not been sufficiently examined, and their careful analysis by competent persons would be more likely to afford useful results than the same amount of labour devoted to the accumulation of fresh records. Of course, if any satisfactory results are to be obtained, meteorological observations must be continued steadily. But it certainly does seem as if some few among the persons who have meteorological matters under their charge, might devote their attention to the work of analysing the millions of observations already collected. Even if it is impossible, as we are disposed for our own part to fear, to deduce any system for predicting weather more than a few hours or a day or two in advance, yet this at least might be done for many regions of the earth, which at present have no warning, even for an hour, of the approach of the most desolating hurricanes. Telegraphic communication, especially as we may hope to see it developed in the coming years, might be employed much more extensively than at present. Thus our own country, which warns countries to the east of coming storms, but receives no warnings, might receive useful intimation from the United States and the West Indies (remote though they are) of the advance of great cyclonic disturbances upon us from the neighbourhood of the West Indies, Florida, and so forth. The further progress of great south-westerly disturbances towards our shores might be learned also from ships which, sailing towards the United States, have encountered rough weather when two or three days' sail from their destination. Ships making for Halifax or St. John's might afford even later intelligence. It is probable that in nearly every case, and certain that in many cases, cyclonic disturbances which have rounded the West Indian part of the great storm-⊂ and travelled along the shores of the United States beyond Hatteras (generally overlapping the land) pursue their course across the Atlantic, though with gradually diminishing force, until they reach Europe. Probably a law would be found to connect their motions, on the western part of their track, and the direction along which they would strike the shores of Europe. Storms which, after rounding the West Indies, pass towards the north-east, without closely approaching the United States, may usually reach the shores of Spain, or the Bay of Biscay, while those which overlap the south-eastern States of America, may pass across the Atlantic on a more northerly track, and make for the British Isles, or pass even north of Scotland to the shores of Norway. As it is probable that very few really fierce hurricanes reach us from the south-west which have not first been felt on the western side of the Atlantic, it would be worth while to analyse very carefully all that can be learned respecting the course of such storms. And certainly the expense of telegraphic communication from the other side of the Atlantic would not be worth considering in comparison with the advantage derived from early intimation of the approach of great hurricanes towards the shores of Europe. In other regions, and especially in the tropics, telegraphic communication might be much more readily and effectively employed in announcing the approach of hurricanes. There are reasons for believing that the great cyclone of October last traversed a course which at several points touched places whence news of the advancing storm might have been telegraphed to the threatened region. Although little could have been done to prevent the destruction to property which the cyclone caused, many thousands of lives (probably more than two hundred thousand) might have been saved if half a day's or even half an hour's warning had been given."

CLOUD-REFLECTING COMPASS.

To the Editor of the Meteorological Magazine.

SIR,—I see in your last number you state that Mr. Goddard exhibited his Cloud-reflecting Compass at the Exhibition in 1851. I therefore very willingly resign to him whatever credit there may be in the invention, as I did not publish the description of mine till 1855. —Yours faithfully,

THOMAS STEVENSON.

Edinburgh, 13th Feb., 1877.

GREENWICH EXTREME TEMPERATURES.

To the Editor of the Meteorological Magazine.

SIR,—I send for publication in your Magazine a very valuable table of Greenwich Extreme Temperatures, which Mr. Brumham has been kind enough to compile for me, thinking some of your readers may like to have copies of it.—I remain, Sir, yours truly,

EDWARD MAWLEY.

Addiscombe, Feb. 6th, 1877.

The extreme Shade Temperatures of the month of January at the Royal Observatory, Greenwich, during the past 36 *years.*

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	deg.	date.	deg.	date.		deg.	date.	deg.	date.
1841	53·0	27	4·0	8	1859	53·0	18	28·5	9
1842	46·8	31	23·2	23	1860	55·5	3	27·5	28
1843	57·0	28	24·0	2	1861	55·0	27 29	16·0	8
1844	53·7	5	18·8	2	1862	55·0	31	20·4	19
1845	51·3	6	24·4	31	1863	55·2	29	27·7	12
1846	55·3	25	29·4	4	1864	54·0	27	14·3	7
1847	49·4	26	24·0	10	1865	50·2	10	19·6	22
1848	50·4	3	16·8	28	1866	54·3	22	23·7	13
1849	56·4	14	19·9	3	1867	54·4	7	6·6	5
1850	53·1	25	23·6	13	1868	51·9	14 17	22·8	3
1851	56·5	1	26·6	24	1869	55·9	31	26·3	24
1852	55·5	16	28·1	5	1870	50·9	8 14	19·6	28
1853	55·5	20	30·8	19	1871	46·7	16	18·3	13
1854	54·8	30	13·5	3	1872	52·7	31	28·3	15
1855	52·4	2	16·2	19	1873	53·8	10	26·0	25
1856	54·0	24	24·3	15	1874	53·0	10	28·1	25
1857	52·7	2	20·0	30	1875	53·7	20	18·2	1
1858	51·9	9	20·9	6	1876	56·1	31	17·4	8

Extremes in 1877, Max. : 56°·1 on 19th ; Min. : 27° 7 on 21st.

	Year.	Max.	Date.	Min.	Date.	Year.
Means of 36 years	...	53·4	18	21·6	14	...
Highest	1843	57·0	28	30·8	19	1853
Lowest.....	1871	46·7	16	4·0	8	1841
Range	...	10·3	...	26·8	...	...

GALE AND HIGH TIDE ON THE EAST COAST OF IRELAND.

To the Editor of the Meteorological Magazine.

SIR,—The gale and high tide of 3rd inst. was so exceptional in its effects on the East Coast of Ireland as to merit some record in your pages.

The tide served on that day about 2 p.m., being shortly after the hour at which spring tides serve in Dublin, and aided by a strong easterly gale, rose to an unprecedented height, washing completely over the Dublin, Wicklow and Wexford Railway, which here (Monkstown) runs along the shore, separated from the sea by a broad pathway and sea wall. This wall, which is sloping and surmounted by a parapet some 3 ft. high and a coping of heavy blocks of granite, was broken down almost all along, the large coping stones being thrown across the pathway on to the rails, thus blocking up the traffic. The water was so deep on the line in some places as to put out the engine fires, and the waiting rooms and booking offices at several of the stations were flooded. Traffic was also stopped at several other places on the Dublin, Wicklow and Wexford Railway, from landslips, washing away of the line by the waves, &c.

The gale, which, though strong, was by no means excessive in its violence, was accompanied by a heavy fall of rain, which owing to their outlets being stopped by the height of the tide, caused many of the streams and sewers to burst up, flooding the roads and rendering them almost impassable in many places.

The amount of rain registered up to 9 a.m. on the 4th was 1·400 in., while at Fassaroe and Enniskerry, Co. Wicklow, 2·3 in. and 2·8 in. respectively were recorded.—I am, Sir, yours faithfully,

GREENWOOD PIM, M.A., F.L.S.

Monkstown, Dublin, 15th Jan. 1877.

THE WEATHER IN CAMBRIDGE IN 1874, 1875, AND 1876.

	1874.	1875.	1876.
Mean temp.	47°·6	47°·7	48°·2
Hottest by Day	July 19, 20	Aug. 16	Aug. 14
	82°	80°	86°
Coldest by Night	Dec. 30	Jan. 1	Jan. 11
	15°	11°	18°
Days on which the max. was at or under 32°	12	12	8
Nights on which the min was at or under 32°	86	70	66
Mean of bar.	29·85	29·85	29·87
Bar. highest	Mar. 7	Oct. 6	Jan. 15
	30·4	30·5	30·6
Bar. lowest	Dec. 11	Nov. 9	Dec. 4
	28·5	28·4	28·4
Rainfall	15·60 in.	26·59 in.	24·63 in.

J. NUTTER.

Beech House, Jan., 1877.

INFLUENCE OF WEATHER ON BIRDS.

To the Editor of the Meteorological Magazine.

SIR,—In several parts of England the green woodpecker is called the "rain-fowl," or "storm-bird," and I have several times seen the question asked whether it deserves the title. The greater part of my boyhood was spent among the Herefordshire orchards, where this species is exceptionally plentiful; and next to cloud-gazing, the pleasantest of my early reminiscences are connected with bird-watching. I used always to observe—and I have noticed the same fact of late years in this neighbourhood—that *P. Viridis* is most vociferous on days of electric disturbance of a particular kind. Its laughing cry is comparatively seldom heard either in settled weather, during or immediately before rain, or when the atmosphere is humid, but is loud and constant on the bright days which often occur after cold clear nights in its breeding season (April and May), when there are large cumulus clouds and distant thundershowers, and a rather calm atmosphere. When the sky becomes much overcast, this species becomes comparatively silent.

In this respect it is in contrast to another common bird, whose loquacity in connection with meteorological conditions I have often noticed, but never seen recorded. The greenfinch is especially noisy in sultry overcast weather, during the growls of an approaching thunderstorm, when most other species of birds seem commonly to feel the oppressiveness of the atmosphere, and to be rather taciturn.

I have often noticed the delight which the swift, in contrast to the swallow, takes in flying very high beneath a dark and threatening storm-cloud.

As regards the cry of the tawny owl, whose habits I have studied closely for many years, I could never myself discover any especial connection between it and the weather.—Yours truly,

W. CLEMENT LEY.

Ashby Parva, Lutterworth, Jan. 29th, 1877.

THE RAINFALL OF THE WINTER OF 1876-77.

THE widespread damage by floods during the last two months, renders it undesirable that the present issue of the *Meteorological Magazine* should appear without some remarks upon the rainfall of December and January. The relation of the fall in each month to the average for each, is shown by the usual monthly tables, and need not therefore be repeated. The following table is, however, very instructive, and especially the last column of it. The last two columns can alone need any explanation. "Mean total for December and January" gives the total for those two months on the mean of the six years, 1860-65. The last column gives the ratio of the fall in 1876-7 to the six years' mean, which is taken as 100. If the mean be considered as 1·00, the first

entry would be 3·19, and so with all the other entries in the column. And that entry of 3·19 shows that the recent fall has been about $3\frac{1}{5}$ times as much as usual; which is evidently the case because the usual amount, 3·45 × 3·19 = 11·00 inches, and the previous column shows that the actual fall was 10·99 inches.

We are now able to consider what this column teaches, and its lessons are perfectly clear, as anyone will see who takes the trouble to mark on a map the figures in the last column. They show that the greatest intensity of the excess, has been over the South Eastern and South Midland counties of England, where the fall has been three times, and even more than three times, the average; that over the rest of England the fall has generally been more than double the average; and that in the North West of Scotland the fall has not been half so much as usual.

	STATIONS.	TOTAL RAINFALL.			Mean Total for Dec. & Jan.	Mean being 100 fall in 1876-7.
		Dec., 1876.	Jan., 1877.	Two months.		
		inches	inches	inches	inches	
ENGLAND.	Camden Square, N.W.	6·25	4·74	10·99	3·45	319
	Selborne (The Wakes)	9·77	8·28	18·05	6·02	300
	Hitchen	5·57	3·74	9·31	3·45	270
	Banbury	5·75	4·21	9·96	3·76	265
	Bury St. Edmunds (Culford)	3·97	2·95	6·92	3·36	206
	Bridport	9·52	6·49	16·01	6·56	244
	Barnstaple	6·91	5·23	12·14	6·64	183
	Bodmin	12·69	8·33	21·02	10·33	204
	Cirencester	7·54	4·45	11·99	5·29	227
	Shifnal (Haughton Hall)	4·75	3·81	8·56	3·58	239
	Tenbury (Orleton)	6·85	3·84	10·69	4·99	214
	Boston	4·26	3·08	7·34	3·20	229
	Manchester	4·44	5·01	9·45	4·85	195
	Skipton (Arncliffe)	10·53	11·17	21·70	10·19	213
	North Shields	6·14	3·08	9·22	4·31	214
	Borrowdale (Seathwaite)	18·31	25·65	43·96	33·31	132
WALES.	Haverfordwest	8·16	8·98	17·14	9·88	173
	Llandudno	4·17	5·14	9·31	4·74	196
SCOTLAND.	Dumfries (Crichton Asylum)	8·68	7·66	16·34	8·21	199
	Braemar	8·70	4·43	13·13	6·90	190
	Portree	5·31	8·26	13·57	28·72	47
	Inverness (Culloden)	1·92	2·39	4·31	4·21	102
	Sandwick	5·95	3·43	9·38	7·26	130
IRELAND.	Killaloe	5·24	6·06	11·30	8·35	136
	Portarlington	6·00	4·39	10·39	7·20	144
	Monkstown (Dublin)	8·50	5·11	13·61	6·01	226

THE HEAT IN AUSTRALIA.

The *Melbourne Argus* of the 27th Dec. says:—"The unusually hot summer in Europe is having its counterpart a few months later in Australia. Early in December warm weather, such as we do not

generally get until a month later, set in, which culminated on the 15th inst. in a day of terrible heat. At the Melbourne Observatory the thermometer recorded 110°·7 in the shade, and in the country districts the heat was still greater, the temperature in the shade at Dunolly, for example, being reported as 116°. The excessive heat, though causing considerable physical suffering and prostration, has not affected the bill of mortality in any marked degree, and although there have been several deaths from sunstroke, the public health continues to be good. Similarly torrid weather has been experienced in the other colonies, the temperature in the shade at Adelaide on the 15th being 114°, while at Walgett, in New South Wales, the unprecedented shade temperature of 124° was registered. In the sun the thermometer marked 188°.

SUPPLEMENTARY TABLE OF RAINFALL IN JAN., 1877.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. XI., p. 28., but the list is under revision and further details will be given in a month or two.]

Div.	Station.	Total Rain.	Div.	Station.	Total Rain.
		in.			in.
II.	Acol	4·68	XI.	Llanfrechfa	10·47
,,	Hailsham	6·95	,,	Castle Malgwyn	...
,,	St. Lawrence, I. of W.	7·35	,,	Heyope	...
,,	Andover	5·64	,,	Carno	...
,,	Strathfield Turgiss	4·02	,,	Rhug, Corwen	6·14
III.	Addington Manor	4·16	,,	Port Madoc	7·94
,,	Oxford	4·50	XII.	Melrose	6·99
,,	Northampton	3·41	XIV.	Cessnock, Glasgow	8·60
,,	Cambridge	2·73	XV.	Gruinart	7·32
IV.	Sheering	4·89	XVII.	Keith	1·20
,,	Ipswich	3·51	XVIII.	Dalwhinnie	1·37
,,	Diss	2·51	,,	Auchnasheen	7·49
,,	Swaffham	3·10	,,	Springfield, Tain	2·79
V.	Compton Bassett	4·37	XX.	Skibbereen	5·78
,,	Dartmoor	17·32	,,	Glenville, Fermoy	7·98
,,	Teignmouth	7·56	,,	Tralee	8·11
,,	Langtree, Torrington	6·83	,,	Newcastle W., Limerick	5·35
,,	Trevarrick, St. Austell.	...	,,	Kilrush	6·10
,,	Taunton	5·19	XXI.	Kilkenny	5·30
VI.	Bristol	4·53	,,	Kilsallaghan	5·44
,,	Sansaw	3·37	,,	Twyford, Athlone	5·61
,,	Cheadle	5·01	XXII.	Ballinasloe	5·12
VII.	Coston, Melton Mowbray	3·61	,,	Kylemore	18·33
,,	Bucknall	3·31	,,	Carrick on Shannon	6·68
VIII.	Walton, Liverpool	5·16	XXIII.	Rockcorry	6·47
,,	Broughton-in-Furness	11·40	,,	Warrenpoint	10·20
IX.	Stanley, Wakefield	3·18	,,	Carnlough, Larne	10.25
X.	Gainford	4·31	,,	Bushmills	6·31
,,	Shap	12·81	,,	Buncrana	6·68

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JANUARY, 1877.

Iv.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of Nights below 32° In shade	On grass
			inches	inches.	in.								
I.	ENGLAND.	Camden Town	4·74	+ 2·79	·60	8	25	56·4	19	28·5	23	5	14
II.		Maidstone (Hunton Court)	6·03	+ 3·99	·98	10	26	...	...	...	...	...	...
,,		Selborne (The Wakes)	8·28	+ 5·01	·88	2	26	53·0	18	27·0	12¶	6	11
III.		Hitchen	3·74	+ 1·60	·65	3	25	52·0	19	26·0	26	17	...
,,		Banbury	4·21	+ 2·12	·84	3	26	55·0	19	28·0	12	11	...
IV.		Bury St. Edmunds (Culford)	2·95	+ 1·08	·56	3	23	55·0	19	24·0	26	11	17
,,		Norwich (Sprowston)	2·49	...	·59	3	24	...	...	...	...	..	...
V.		Bridport	6·49	+ 3·30	·61	6	24	54·0	4	29·0	12	...	7
,,		Barnstaple	5·23	+ 1·71	·60	2	28	57·0	4*	33·0	13	..	...
,,		Bodmin	8·33	+ 3·14	1·40	2	28	53·0	3	31·0	13	1	3
VI.		Cirencester	4·45	+ 1·45	·75	3	23	...	...	...	...	...	...
,,		Shifnal (Haughton Hall)	3·81	+ 1·91	·92	3	22	53·0	19	27·0	12	13	19
,,		Tenbury (Orleton)	3·84	+ 1·31	·77	3	27	56·3	19	27·2	12	8	16
II.		Leicester (Belmont Villas)	3·11	...	·79	3	24	57·0	19	30·5	12	2	...
,,		Boston	3·08	+ 1·37	1·28	3	21	57·0	19	30·0	13**	5	...
,,		Grimsby (Killingholme)	2·81	...	·90	3	22	56·0	19	31·0	27	1	...
,,		Mansfield	4·15	...	1·51	3	26	56·8	19	26·0	12	6	15
II.		Manchester	5·01	+ 2·49	·86	29	23	57·0	19	...	...	2	21
IX.		York	3·20	+ 1·62	·84	3	17	57·0	19	27·0	25	11	...
,,		Skipton (Arncliffe)	11·17	+ 5·53	1·80	29	28	47·0	8	21·0	1	...	15
X.		North Shields	3·08	+ ·97	·71	3	25	54·6	19	27·0	3	10	11
,,		Borrowdale (Seathwaite)	25·65	+ 9·29	3·21	16	26	...	...	...	...	..	...
XI.	WALES.	Cardiff (Ely)	...	...	...	...	...	...	...	...	...	...	...
,,		Haverfordwest	8·98	+ 3·93	1·31	6	24	54·0	19	31·5	19	1	6
,,		Aberdovey	5·71	...	...	...	...	55·0	29	33·0	3, 12	0	...
,,		Llandudno	5·14	+ 2·60	·70	29	24	56·2	19	31·0	12	1	..
II.	SCOTLAND.	Dumfries (Crichton Asylum)	7·66	+ 3·47	·95	5	26	51·0	2	25·0	3	7	16
,,		Hawick (Silverbut Hall)	6·43	...	·73	4	25	...	...	..	...	...	...
V.		Kilmarnock (Annanhill)	5·48	...	·57	16	28	54·2	20	24·0	2	6	12
V.		Castle Toward	7·53	+ 1·24	1·13	30	28	49·0	7,19	20·0	2	22	...
I.		Mull (Quinish)	5·81	...	1·57	21	15	...	...	...	...	...	...
,,		St. Andrews (Cambo Ho.)	4·45	...	...	...	...	..	...	...	...	...	...
,,		Grandtully	6·72	...	·90	29	19	...	...	...	...	...	...
I.		Braemar	4·43	+ 1·30	·72	30	25	45·0	19	4·0	3	25	30
,,		Aberdeen	3·31	...	·61	29	23	48·7	19†	20·6	3	5	26
II		Gairloch	4·38	...	·57	29	21	...	...	...	...	...	..
,,		Portree	8·26	— 4·83	1·31	23	25	...	...	...	...	..	...
,,		Inverness (Culloden)	2·39	+ ·11	1·11	31	18	49·9	16	16·5	3	13	30
X.		Helmsdale	2·82	...	·46	6	22	...	...	...	...	...	...
,,		Sandwick	3·43	+ ·13	·87	19	24	48·0	25	26·4	11	6	21
X.	IRELAND.	Caherciveen Darrynane Abbey	7·40	...	·60	5	30	...	...	...	...	...	...
,,		Cork	8·08	...	1·50	2	26	...	...	...	...	...	...
,,		Waterford	6·55	+ 1·69	·66	3	27	52·0	3,4‡	30·0	2††	3	...
,,		Killaloe	6·06	+ 1·20	·73	28	26	53·0	4,16	22·0	2	11	...
I.		Portarlington	4·39	+ ·38	·44	8	31	52·0	16	30·0	19	8	...
,,		Monkstown, Dublin	5·11	+ 1·72	1·40	3	22	53·0	16§	28·0	13	7	...
II.		Galway	6·90	...	·60	18	28	55·0	21	29·0	26	4	...
,,		Ballyshannon	7·69	...	1·04	3	29	...	...	...	...	...	...
II		Waringstown	5·68	...	·90	3	29	51·0	16‖‖	26·0	1, 12	14	21
,,		Edenfel (Omagh)	6·79	...	1·10	3	29	50·0	16‖	27·0	12	14	...

* And 19, 20. † 21. ‡ 7, 8, 29. § 30. ‖ 31. ¶ 21:
** 23, 27. †† 3, 13. ‖‖ 19.

+Shows that the fall was above the average ; —that it was below it.

METEOROLOGICAL NOTES ON JANUARY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

SELBORNE—An unusually mild and wet month; in the last two months R has been measured on 50 days, and on many others some R has fallen, but not enough to be measured.

HITCHEN.—Hurricane on the 1st; terrific gale on 30th; and altogether the stormiest January in our record.

BANBURY.—High winds on 6th, 10th, 14th, 18th, 23rd, 24th and 29th, and a very high wind on 30th, with H; L on 28th.

CULFORD.—Stormy on the 1st; high wind on 10th, 18th and 29th, and violent gale on 30th. A month of great rainfall, but mild for the season; the mean temp. being 40°·8. No S during the month. High wind from N.W. during the whole of the 29th, which during the night became the most terrific gale which has been experienced in this neighbourhood for many years; this wind continued during the whole of the 30th, causing great injury to property of various kinds, unroofing buildings, blowing out windows, and uprooting many valuable and ornamental trees, which centuries will hardly replace.

SPROWSTON.—No S fell during the month, nor as yet has any been recorded this winter in this part of Norfolk. A very wet and mild month. Terrible gale on 30th, doing much damage to houses and trees.

BODMIN.—Average bar. during month 29·90 in.; mean temp. 45°·9, being the highest for January ever registered here.

SHIFNAL.—The new year brought no better weather; R still continuing, with a slight respite from 6th to 12th, when it returned with all its copiousness, lasting daily with three exceptions (20th, 21st and 22nd), till the close. The fall of ·92 in. on the 3rd was almost unprecedented in January in this neighbourhood. Although there were 13 frosty nights they were scarcely strong enough to form ice. A severe storm from S.W. and W. on the 6th, p.m. and all night, and again on 9th, and a fearful storm on the morning of 29th. Strange halo round the moon on night of 28th. Slight S on 12th and 28th; winds chiefly from S.W. or W.

ORLETON.—River flooded at the beginning of the month. A very dull and rainy month, with frequent variations in temp., and very little sun. The ground was slightly covered with S on the morning of the 29th, followed by R and a great gale of wind, which blew down many trees before it abated on the following day. Lunar halos frequent at the end of the month, and there was a large bright solar halo from sunrise to 10 a.m. on the morning of 31st. The mean temp. of the month was about 3°·$\frac{1}{4}$ above the average.

LEICESTER.—A very wet month, although the fall here has been less than in most parts of the country. Very mild for the season; the mean temp. about 6° above the average. Much S.W. wind. A violent gale on night of 29th and day of 30th, with showers of S and R.

BOSTON.—The heavy rainfall at the end of December and the beginning of this month has caused the worst floods that have been known in the Fen country for years. Owing to the height of the water in the river Witham, and the defective condition of its outfall, a great part of the lower districts in the city of Lincoln was flooded, and the inhabitants driven from their houses. Several of the barrier banks were broken in the side drains between Lincoln and Boston, and it was computed that 40 square miles of the best agricultural land was inundated to a depth of from one to five feet. The river Glen also broke its banks in three places, and inundated Bourne North Fen and part of Pinchbeck. To add to the list of disasters on the 30th, the wind, which all the previous night had been blowing a gale from the S.W., flew round to the N.W., and this occuring near the full moon brought up the largest tide which has been known here since

1854; the evening tide being 4-ft. 3-in. above that of the morning. Two sea banks (of land recently reclaimed) gave way, and a large tract of land sown with wheat is inundated. The temp. of the month was 3°·8 above the average.

GRIMSBY.—Bar. 28·65 in. all the forenoon of the 1st; high tide in the Humber; aconites in flower on 6th; hazel catkins shed a little pollen on 19th, extremely mild day; large lunar halo on 24th; high tide in the Humber and gale all day on 30th.

MANSFIELD.—The month has been characterized by almost entire absence of frost, by dull, damp days; and by occasional violent winds, rising on 28th and 29th to almost a hurricane. Little S has fallen. Vegetation is very forward, the gooseberry trees showing leaves in a tolerably expanded condition.

ARNCLIFFE.—Very wild, with a deep fall of S, on 3rd; S also fell on 12th. Gale from the W. on 29th, with 1·80 in. of R, the max. fall of the month.

NORTH SHIELDS.—Near lunar halo on 1st, a distant one on 2nd, followed by a stormy day on 3rd, when ·71 in., the max. fall of the month, occurred. Wall-flower in flower on 18th; polianthus on 19th; and periwinkle on 27th. S fell on 28th.

SEATHWAITE.—Total fall of R during the month 25·65 in., being 9·29 in. above the average; there were 10 days on which the fall exceeded 1·00; 6 on which it reached 1·50 in.; and 3 on which more than 2·00 in. fell; the max. fall being 3·21 in. on 16th. On the 4 days 15th–18th inclusive 6·86 in. fell.

WALES.

HAVERFORDWEST.—Very stormy, wet month, and extremely mild. Fearful weather on 6th and 7th; bar. 28·71 in. at 4 p.m. of 6th; T, with vivid forked L and H, with terrific squalls, at 6·45 p.m. A very violent and sudden gale from the W. on 19th, lasting with great violence from 1 to 4 p.m.; pressure 20 lbs. on the square foot; velocity 64 miles an hour. The weather notably stormy again; during this very stormy month, on the 28th, T, vivid forked L, and H, with very heavy squalls.

MACHYNLLETH.—A very wet, mild and stormy month. A very stormy night on 29th; many trees blown down; great damage done to railway and other property about here.

LLANDUDNO.—The month began and ended with stormy weather; the rainfall was double the average, a great portion of which, however, fell during the nights. There were many fine days in the month. Mean temp. about the average. There was only one night's frost, and that very slight. Primroses were gathered in the lanes on the 18th.

SCOTLAND.

DUMFRIES.—January shows a heavy rainfall (7·66 in.), but still 1·00 in. below that of last month. S fell on 10th, 13th and 26th, but only to the depth of a few inches. High winds have been prevalent. Bar. has been abnormally steady during the storms, and the mean temp. (41°·01) unusually high.

HAWICK.—Total fall 6·43 in., being 3·07 in. above the average of the last 11 years. Very stormy on New Year's Day, and 4th, 6th, 7th, 8th, and 28th. The long continued rains have kept back all out-door work, and gardening and husbandry operations have frequently been performed under the friendly shelter of siphonias and oil-skin capes. Mavis first heard whistling on the 20th.

ANNANHILL.—The year opened with a gale from S.E.; S and R. The month was generally unsettled; hard gales blowing from S.E. or S.W. on 11 days; max. anemometer, reading on the 28th with fine S; L was seen on 14th and 28th.

CASTLE TOWARD.—A very stormy month; the storms have been been heavier this month than have been experienced in this district for many years; morning frosts have been frequent, but not of long duration; there has not been much S, but a great deal of sleet and R and very strong winds; on the 28th a very severe thunderstorm. the L very vivid, with pelting showers of H.

ABERDEEN.—Bar. pressure below the average (20 years); temp., R, and wind pressure rather above it; a month of very unsettled weather, mild, but rather wet; comparatively little S except during the first week.

PORTREE.—A very changeable month; gales on 18th, 21st, 25th and 28th from S. to S.W.; squally on 29th and 30th; T and L on 21st, 28th and 29th, with heavy S and H showers.

CULLODEN.—Intense frost on 3rd, 16°·5 in air and 11°·1 on grass, followed by three snowy days; a large lunar halo and strong gale from S.S.W. on 25th; S more or less on 11 days; S on 31st 5 inches deep.

IRELAND.

WATERFORD.—The wind was S. or S.W. on twenty days during the month, and S.E. on two days; the remaining days it was N., N.E. or N.W.

KILLALOE.—A great depression of bar. on 7th (28·30), unattended with much R and wind, not more than a stiff breeze; however, much R and very high winds seem to have prevailed in other parts of the country. 28th, frequent and very violent hailstorms and heavy squalls from W., which continued unabated to the evening of the 30th.

MONKSTOWN.—Month very wet and comparatively mild; no snow or severe frost; very heavy easterly gale, accompanied with heavy R on 2nd, which caused great damage. Bar. variable, 28 90 on 1st, and 30·59 on 22nd.

GALWAY.—Frequent storms during the month, accompanied by high tides. Direction of the wind generally *westerly*.

BALLYSHANNON.—The month has been remarkable throughout for heavy and constant rainfall, high winds, and floods, though the last month of 1876 was so unusually wet, this month (7·69) has exceeded it by 2·48 in. The river Erne is greatly swollen, and the low lands on its banks are all under water. On the 28th the tide rose higher than it has done for many years, and those of the 29th and 30th reached a still higher point. The bar has been very unsteady, and the temp. high.

WARINGSTOWN.—Very wet, stormy, and mild.

EDENFEL, OMAGH.—Remarkably wet, remarkably stormy, and remarkably mild.

THE WINTERS OF 1841–2 AND 1876–7.

To the Editor of the Meteorological Magazine.

SIR,—The enclosed is from a record kept by the late Wm. Goldney, Esq., of Clifton, near Bristol. Such a wet season having been succeeded by a very fine one may give despairing people hope.

Very truly yours,

R. C. A. PRIOR.

From Wm. Goldney's record.

1841. Aug. 15th.—Eight weeks' rain. Prayer read for fine weather on 8th and 15th.

,, 26th.—Weather improved. This the first fine day that gives hope of the harvest being got in well.

1842. Jan. 1st.—Not one day's skating during December. Continued rain for the last ten weeks.

June 19th.—Rain; the first for nearly two months.

Aug. 1st.—All last month extremely fine. Corn cut on Dundry Hill.

,, 6th.—Rain; the first wet day for six weeks.